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(54) **Mechanical servo trigger mechanism for automatic guns.**

(57) A mechanical servo trigger mechanism for automatic guns provided with a pressure ramp (1) for moving the weapon trigger (17) between a firing and a non-firing position. The ramp (1) is mounted in a parallel link connection (3) that is connected with a base plate (2) so that the ramp (1) is movable to an upper from a lower position by a further link means (4) biased by a spring (5) towards its upper

position, and lockable in a cocked position by a spring-biased trigger locking hook (11) which is releasable by a trigger rod (12). A stop movable by an arm (6) is able to hold the ramp (1) in its upper position, which causes automatic firing of the weapon. Said mechanism can be cocked manually or automatically by a cocking rod acting on a first roller (9) provided on the further link means (4).

Fig.2.

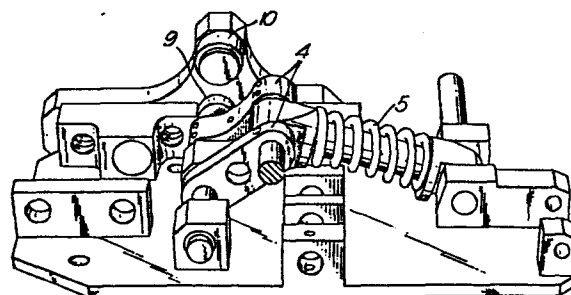
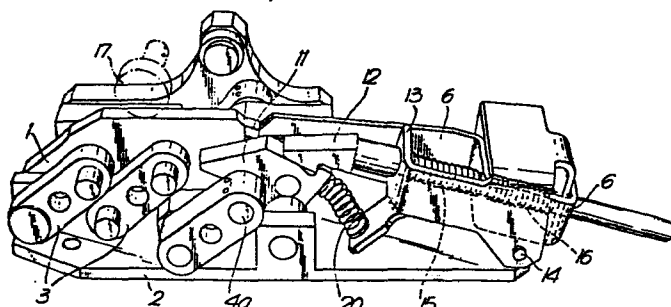


Fig.4.

MECHANICAL SERVO TRIGGER MECHANISM DEVICE

The present invention relates to a device in a mechanical servo trigger mechanism for automatic guns to be provided on the bottom of the gun cradle and comprising a pressure ramp which moves the gun trigger between a position at safety, a position ready for firing, and a firing position respectively, and comprising a spring biased trigger hook system actuated by a separate trigger and adjustable between single shots and bursts of fire.

There are various known embodiments of trigger mechanisms for automatic guns. However, they are usually provided with an electric or electrohydraulic drive requiring the presence of power supplies, which may create a problem, especially in the case of field guns and particularly in cases of long-lasting fire. Furthermore, servo trigger mechanisms of mechanical kind are known, but the known mechanisms have a relatively complicated structure comprising a series of precision mechanical members rendering said mechanism sensitive and maintenance difficult.

It is an object of the present invention to provide a new kind of a servo trigger mechanism that is more sturdy and reliable, and is easier to keep in good repair than the previously known mechanisms. It is also an object to provide a design that has a simple structure and thus, also is simple to maintain. In order to achieve the highest possible universal usability of said mechanism it should also be independent of the shape and mode of operation of the gun trigger mechanism control member. The trigger mechanism is usually arranged below the weapon per se and it is, thus, essential that the overall height of the mechanism be not too large.

The trigger force necessary for the trigger of automatic guns is also relatively high, e.g. approximately 100 kp. This means, in turn, that the trigger mechanism must be able to exert relatively high force and stand the necessary load in connection with said force as well. Consequently, all elements must be structured for exerting relatively large moments.

The mechanism should be of such a kind as to be driven i.e. cocked by the recoil force of the gun after an initial cocking movement that has to be carried out manually or, e.g. with the aid

of an external drive member. Furthermore, it must be possible to adjust the mechanism for single shots as well as for automatic firing.

The above features are achieved with a mechanical servo trigger mechanism of the kind mentioned in the introductory part and characterised as stated in the claims hereinafter.

According to the invention a mechanical servo trigger mechanism is thus achieved that is comprised of simple, sturdy elements that may easily be exchanged in case of a defect. The entire device is arranged on a common bottom frame which is shaped in such a manner by simple milling methods that bearings for links and points of attachment are easily accessible. Said device is easily mounted in the cradle of the weapon directly below the gun and with the aid of a simple rod mechanism it may be moved into a cocked condition by the recoil force of the gun. Furthermore, the device is constructed in such a manner that very few movements need be executed in connection with automatic firing and wear may be reduced to a minimum.

In the following the invention will be disclosed in more detail with reference to an embodiment shown in the drawings, wherein:

Figure 1 is a perspective view, seen from above, of the base plate of a device according to the invention with several shaft bearings indicated,

Figure 2 is a perspective view, seen at an angle from above and in the direction of the arrows at plane A-A in Figure 1,

Figure 3 is a perspective view with parts lying in front of the plane B-B being deleted, seen in the direction of the arrows,

Figure 4 is a perspective view with parts lying in front of the plane C-C being deleted, seen in the direction of the arrows,

Figure 5 is a perspective view with parts lying in front of the plane D-D being deleted, seen in the direction of the arrows, and

Figure 6 is a perspective view, seen from above, showing the arrangement for switching the trigger mechanism from single shots to automatic firing.

The mechanical servo trigger mechanism is not shown in its entirety in the drawings. Instead those portions that are essential according to the invention as well as the interplay

between them are shown, this probably representing the concept of the invention in the best manner. From the perspective view of Figure 1 it will be seen how different pivots and fixation points for the separate members of the mechanism are arranged on a base plate 2. In Figure 1 shaft mountings and fixing points for elements 3, 4, 7, 11, 14, 10 and 9 respective are indicated.

The device according to the invention will now be described with reference to the perspective illustrations in Figures 2-5, and the perspective view in Figure 6, the elements and their positioning being disclosed in connection with the performance of the device.

The element of the servo trigger mechanism which acts on the gun trigger is a pressure ramp designated 1 in the Figures. The trigger of the weapon is designated 17 and indicated with broken lines in Figures 2 and 3. The ramp 1 is connected with the bottom frame or base plate 2 of the mechanism via a link connection, two link members 3 being used, arranged mutually in parallel to form a parallelogram linkage. The ramp 1 is liftable by the action of further link members 4 parallel with the link members 3. The link members 4 are provided in parallel on common shafts, the uppermost of these shafts being designated 4a in Figure 2. The shaft 4a bears freely against one end of the ramp 1 as shown in Figure 3. The ramp 1 is pushed up into its uppermost position and maintained in said position by a spring 5 coupled to the uppermost shaft 4a of the link members 4 as shown in Figure 4. The spring 5 is shown in a compressed position in Figure 4, i.e. a position where the ramp 1 is pulled down as disclosed in more detail below.

The ramp 1 can also be held in its uppermost position by engagement of a stop 7, as will also be disclosed in the following. The stop 7 is seen in Figure 3 in a disengaged position.

The ramp 1 is moved from its starting position, i.e. its upper position, to its lower position before the first shot is fired by the weapon, with the aid of a manual cocking arm or the cocking mechanism of the gun (not shown in the drawings), which may be of a conventional kind. This manual cocking arm is also lockable and, thus, acts as a safety means for the weapon. The cocking arm or cocking means may e.g. also be electrically or hydraulically operated. The lower position of the ramp 1 is its cocked position.

After firing of the first shot the ramp 1 will automatically be moved to its cocked position by the action of a cocking rod 8 (Figure 5) which is operated by the gun recoil. The cocking rod 8 is acted on by a member on the gun that is moved to the right in Figure 5 due to recoil movement and will compress spring 5 (Figure 4) via link members 4, via a roller 9 on these link members. The counteracting force thus created by roller 9 is resisted by a second roller 10 mounted on an arm that is rigidly attached to base plate 2 of the device. In this movement the link members 4 are moved rearwards and the ramp 1 turns with the parallelogram link members 3 into its lower position, i.e. its cocked position. The rod 8 has a chamfered portion at the end area between the two rollers 9 and 10.

The ramp 1 will remain in this lower cocked position due to the fact that the link members 4 are kept down by a trigger hook 11, friction and springs 15 and 20 keeping the hook 11 in engagement with the shaft 4a. This holding action is shown in Figure 2.

When single shots are fired trigger hook 11 is retracted by a trigger rod 12 provided with a trigger (not shown). The trigger rod 12 is located in a support 13 which in turn is mounted on a shaft 14. When its trigger is pulled, trigger rod 12 releases trigger hook 11 from the link shaft 4a. Trigger hook 11 is automatically moved forward by the spring force of a spring 20 to catch shaft 4a when the ramp 1 returns into its cocked position. Trigger rod 12 is moved forward by spring 15 when its trigger is released. As mentioned above the trigger hook per se is moved back into a position in which it is engaged with the shaft 4a by the spring 20 shown in Figure 2.

The device also comprises an automatic locking means in the form of the stop 7 as shown in Figure 3, said locking means being operated by an arm 6. The stop 7 is used in connection with automatic firing. For the firing of single shots, the arm 6 is locked in its forward position, which is shown in Figure 3.

For automatic firing, the arm 6 is unlocked, the trigger rod 12 pulled back, and spring 15 pushes against the arm 6 (see Figure 6). When the ramp 1 reaches its upper position spring 15 will at the same time via arm 6 turn the stop 7 into a position with a surface 18 of the stop 7 in contact with a surface 18' on the ramp 1, which

prevents the ramp 1 from falling down. In this manner the gun trigger 17 is held in a permanent firing position without any parts of the mechanism moving and, thus, with reduced wear. The link members 4 are held in their lower position by the trigger hook 11 after the firing of the first automatic shot. When the trigger on the trigger rod 12 is released the trigger rod 12 re-engages the trigger hook 11, and a spring 16 provided in line with spring 15 will push arm 6 forward again and the stop 7 will be moved from its locking position of contact with the ramp surface 18' into the disengaged position shown in Figure 3. The ramp 1 will then fall down and firing stops. The adjustment from single shots to automatic firing is carried out by releasing locking means (not shown) for the arm 6. For single shots arm 6 is locked so far forwards that the stop 7 cannot lock the ramp 1 in its upper position.

In the drawings only one practical embodiment of a servo trigger mechanism according to the invention is shown, and it will be obvious that the structure of single parts and their mutual action may be modified in many ways within the scope of the invention.

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CLAIMS

1. A device in a mechanical servo trigger mechanism for automatic guns to be provided on the bottom of the weapon cradle and comprising a pressure ramp (1) which moves the trigger (17) of the weapon between a firing and a non-firing position and comprising a spring biased trigger hook system that is releasable from a separate trigger and may be adjusted between single shots and firing burst, characterised in that the pressure ramp (1) is mounted in a parallel link connection (3) that is revolvably connected with a base frame (2), that the ramp (1) is liftable by the action of a further link means (4) that is parallel with said parallelogram connection and is spring biased (5) to an upper position, that said further link means (4) is lockable in a position with its spring biasing means (5) in a stressed condition with the aid of a spring biased trigger locking hook (11) that is movable via a spring biased trigger rod mechanism (12), and that an automatic locking means (7) is provided and is operable via an arm (6), said locking means (7) being provided with a contact surface (18) arranged to lie freely below the said ramp (1) or alternatively, in contact with the said ramp (1) in the upper position of the ramp (1).

2. A mechanism according to claim 1, characterised in that a first roller (9) is provided on the further link means (4), that vertically above the first roller (9) a second roller (10) is provided and is rigidly secured to the base frame (2), that in the space between the two rollers (9, 10) a rod (8) is provided having a chamfered portion at the end area between rollers (9, 10) and at its other end being in contact or connected with a recoiling portion of the weapon.

3. A device according to claim 1, characterised in that the base frame (2) is one piece and has upward projecting mounting blocks for the different shafts.

Fig. 1.

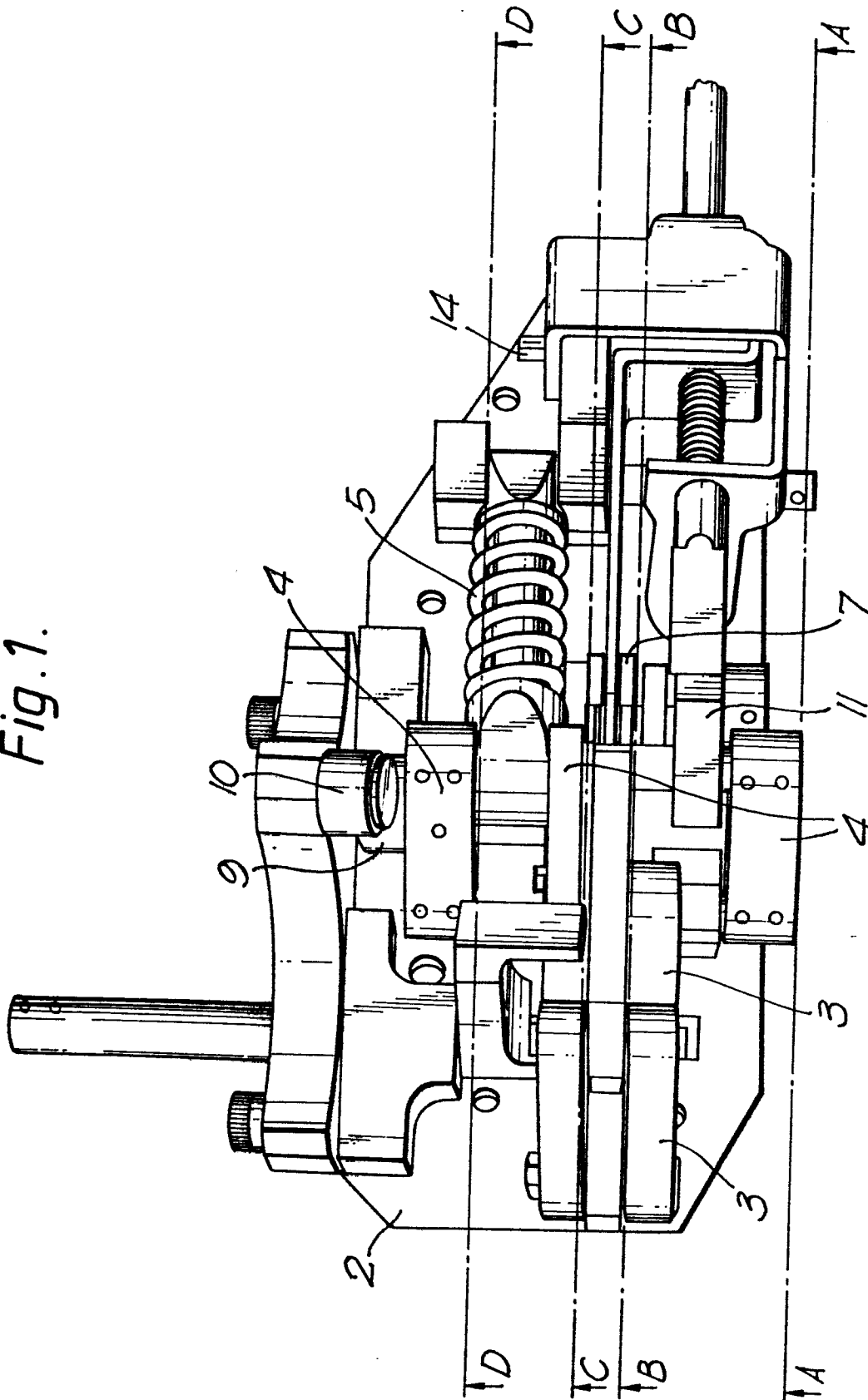


Fig. 2.

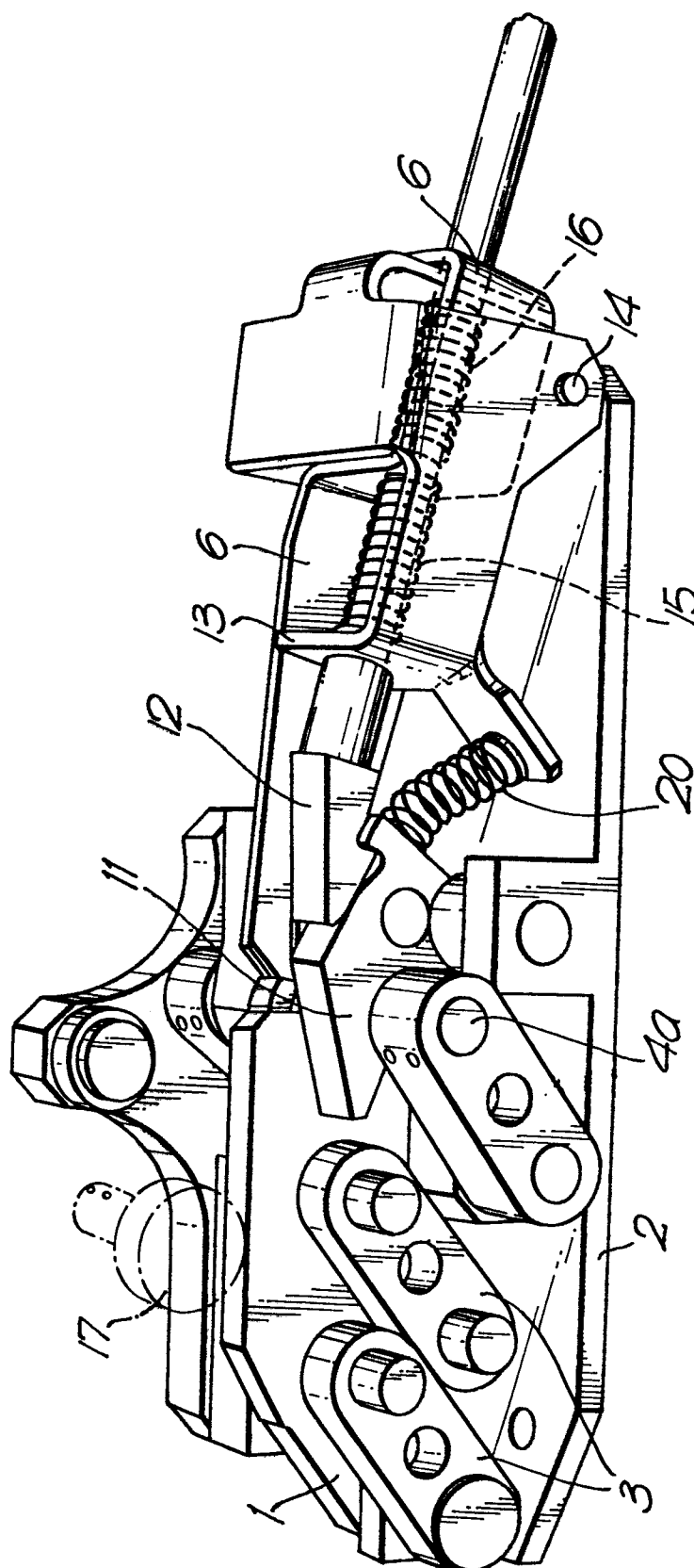


Fig. 3.

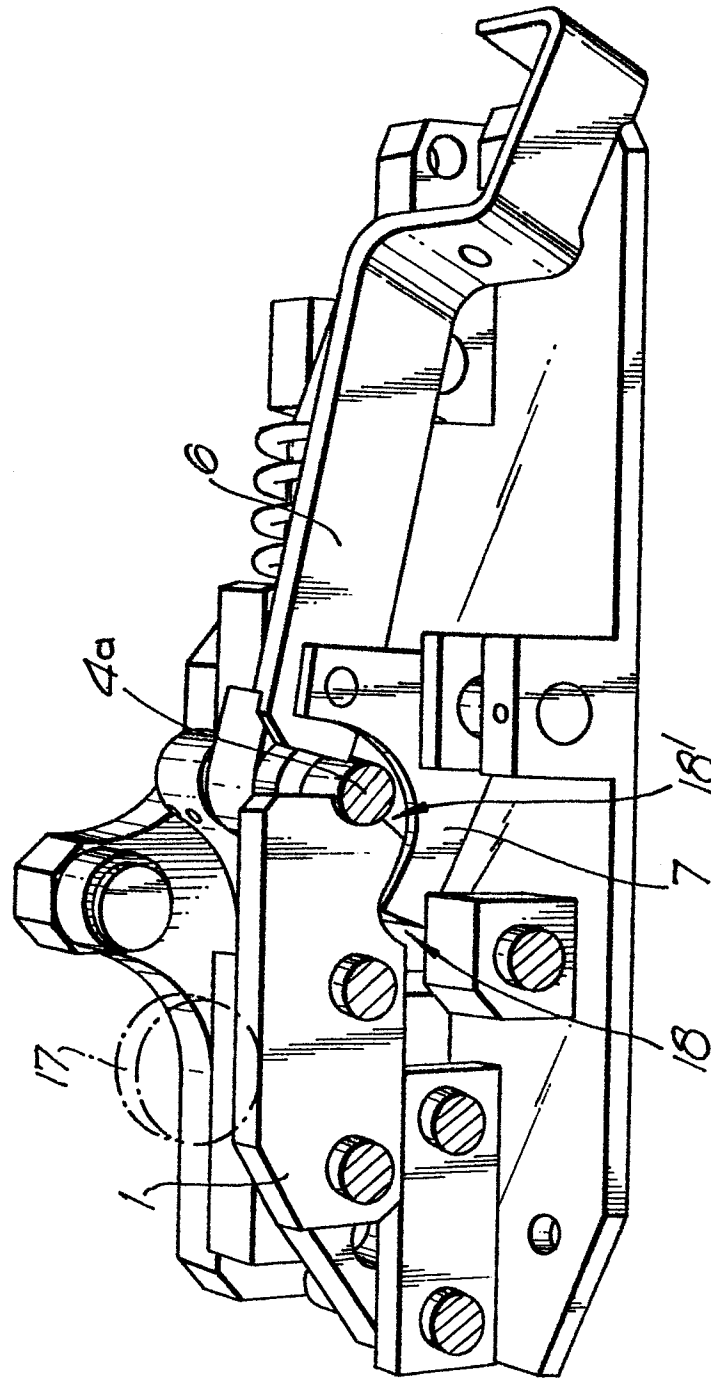


Fig. 4.

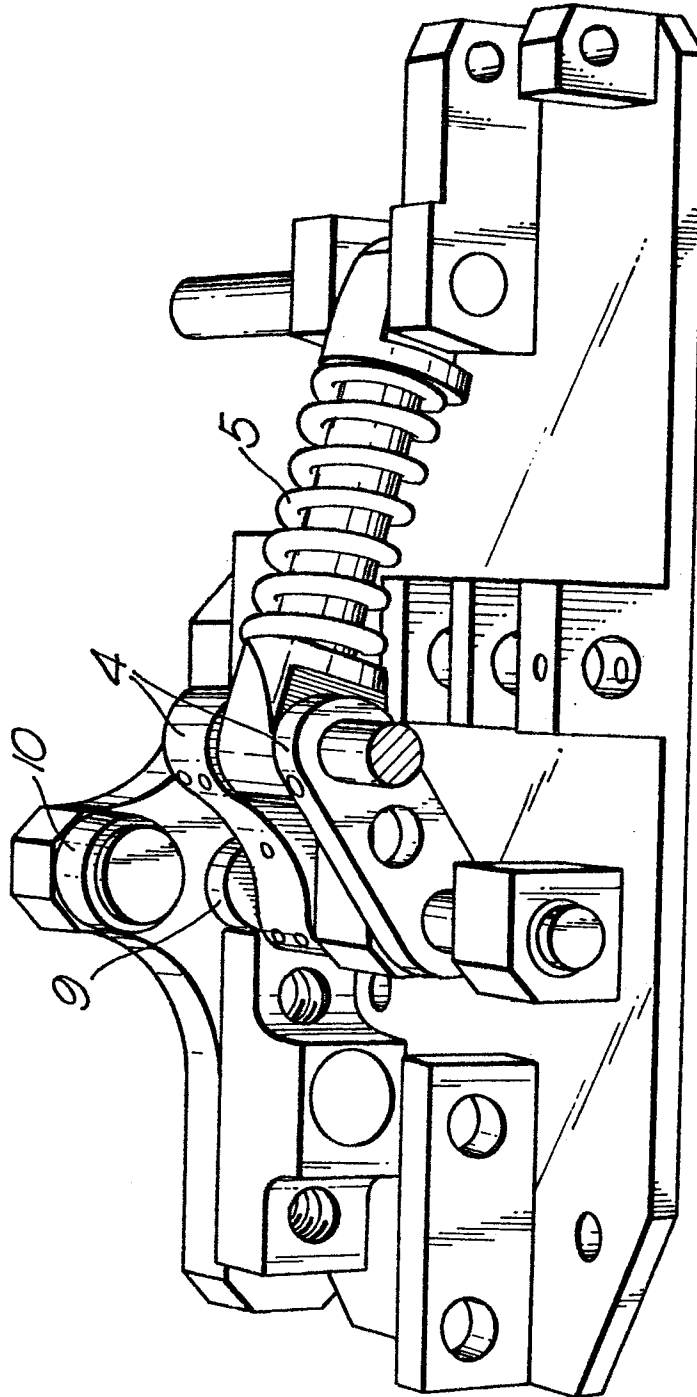


Fig. 5.

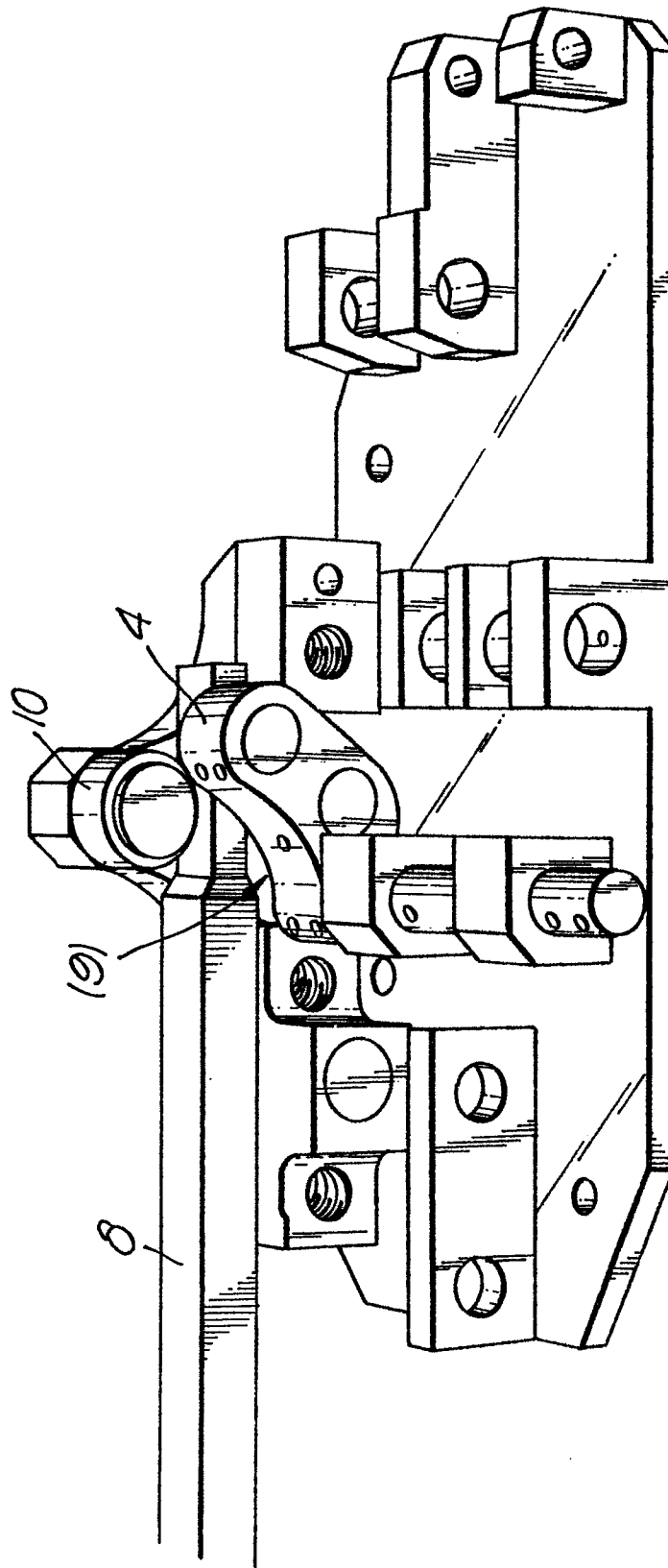
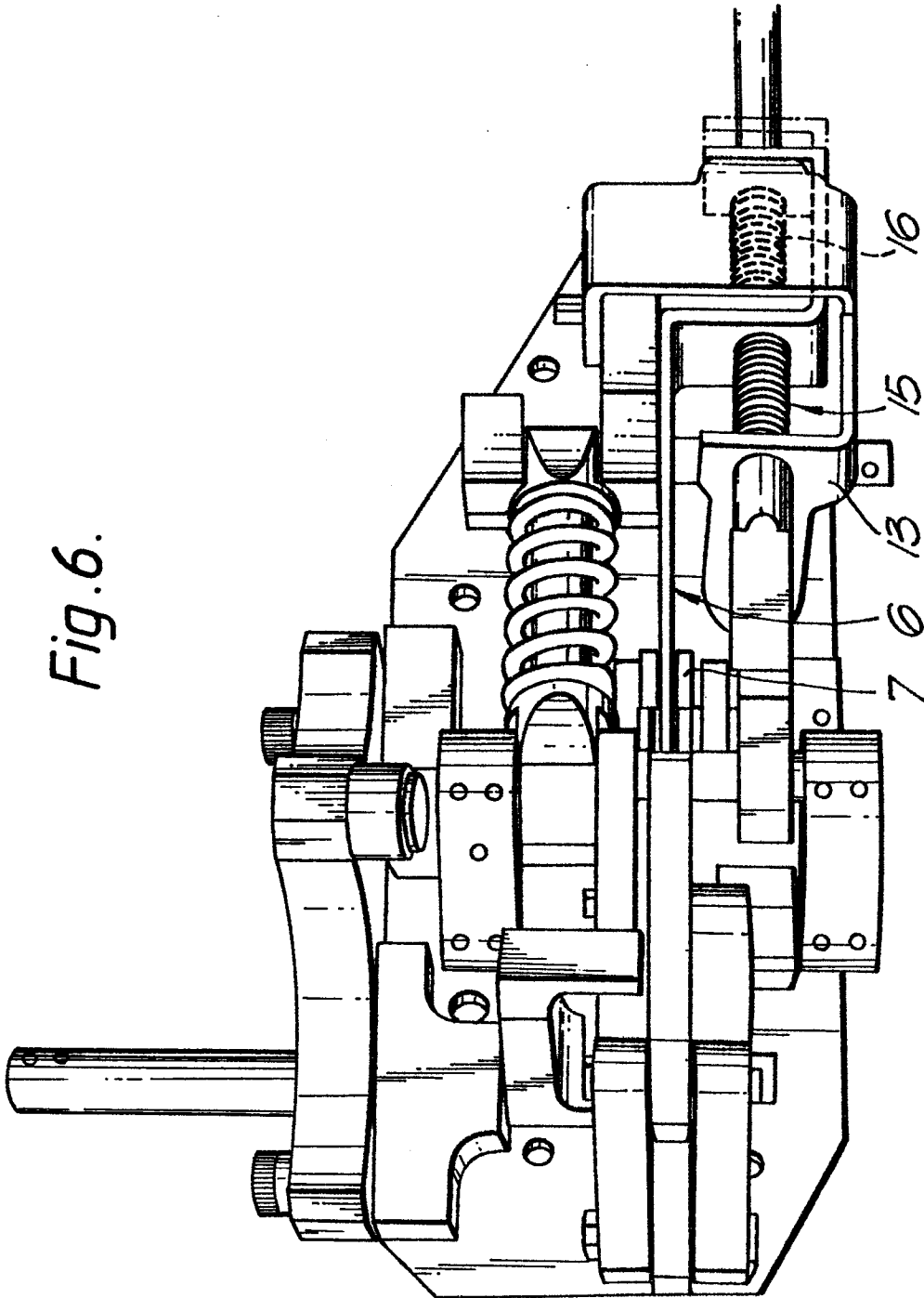


Fig. 6.



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
A	CH-A- 509 563 (BRIEGER et al.) * Figure 1; column 2, lines 24-40; column 3, lines 1-9; column 4, lines 16-36 *	1	F 41 D 11/02
A	DE-C- 712 152 (EXCELSIOR) * Figure 1 *		
A	DE-A-3 001 490 (KLINGAUF)		
			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
			F 41 D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 04-03-1986	Examiner FISCHER G.H.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	